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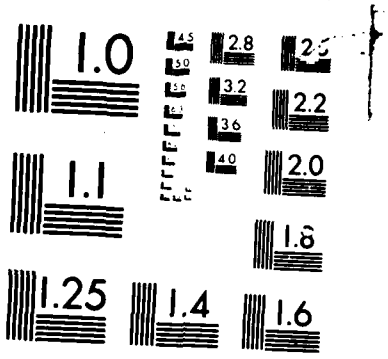
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Among the important results discovered by this research are: (1) The ability of luminescence probes to determine the nature and extent of binding of substrates to cyclodextrins; (2) The use of fluorescence probes to determine critical micelle concentrations, to reveal surfactant/polymer interactions; (3) The utility of fluorescence probes for investigation of non-ionic surfactants and of ionic/non-ionic surfactant interactions; (4) The ability of fluorescence probes to investigate the interactions of metals and surfactant

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20. ABSTRACT CONTINUED

crown ethers; (5) The use of phosphorescence metal complexes to study the nature of metal binding to DNA; (6) The utility of fluorescence probes to reveal temperature and pressure effects on the properties of water soluble block co-polymers; (7) The ability of fluorescence probes to elucidate the nature and mechanisms of cation formation and proton transfer in aqueous systems. Finally, an extensive review of photochemical reactions in micelles was published.

LUMINESCENCE PROBES FOR THE INVESTIGATION OF THE STRUCTURE AND DYNAMICS OF AQUEOUS SOLUTIONS OF MICELLES AND RELATED SYSTEMS

FINAL REPORT

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April 9, 1986

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FORWARD

The important goals of this research were to generate new and fundamental paradigms that would enhance the understanding of the nature of hydrophobic interactions of aqueous solutions of micelles, cyclodextrins, polyelectrolytes, and water soluble polymers. Such knowledge is expected to be valuable in solving a broad range of problems of mechanistic, industrial, and biochemical importance. The molecular substrates employed in our studies were luminescence probes (fluorescent and phosphorescent) whose measurable parameters report the chemical and physical nature of their environment.

STATEMENT OF PROBLEMS STUDIED

The nature and dynamics of hydrophobic interactions that cause water insoluble materials to dissolve in an aqueous medium containing microscopic aggregates such as micelles, cyclodextrins, and polyelectrolytes are of enormous importance in a variety of processes because of the ubiquitous nature of aqueous systems in industry and in biology. Surface and bulk properties of aqueous solutions are often controlled by hydrophobic interactions. An understanding of the nature of hydrophobic forces and of the dynamics of the hydrophobic particles and of the molecular substrates solubilized by hydrophobic particles is available by the use of luminescence probes. We have employed time resolved and steady state luminescence measurements to examine the nature and dynamics of hydrophobic species in aqueous solution.

SUMMARY OF IMPORTANT RESULTS

Thirteen publications have resulted from research supported by AOR Grant P-19800. Among the important results discovered by this research are: (1) The ability of luminescence probes to determine the nature and extent of binding of substrates to cyclodextrins.[1,2]; (2) The use of fluorescence probes to determine critical micelle concentrations[3], to reveal surfactant/polymer interactions[4]; (3) The utility of fluorescence probes for investigation of non-ionic surfactants[5] and of ionic/non-ionic surfactant interactions[6]; (4) The ability of fluorescence probes to investigate the interactions of metals and surfactant crown ethers[7,8]; (5) The use of phosphorescence

metal complexes to study the nature and dynamics of metal binding to DNA[9]; (6) The utility of fluorescence probes to reveal temperature and pressure effects on the properties of water soluble block co-polymers[10]; (7) The ability of fluorescence probes to elucidate the nature and mechanisms of cation formation and proton transfer in aqueous systems[11,12]; Finally, an extensive review of photochemical reactions in micelles was published[13].

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